

Interactive
Comment

***Interactive comment on* “Heterogeneous reaction of N₂O₅ with airborne TiO₂ particles and its implication for stratospheric particle injection” by M. J. Tang et al.**

Anonymous Referee #1

Received and published: 16 April 2014

acp-2014-75 Submitted on 28 Jan 2014 “Heterogeneous reaction of N₂O₅ with airborne TiO₂ particles and its implication for stratospheric particle injection” M .J. Tang, P. J. Telford, F. D. Pope, L. Rkiouak, N. L. Abraham, A. L. Archibald, P. Braesicke, J. A. Pyle, J. McGregor, I. M. Watson, R. A. Cox, and M. Kalberer

The research carried out on the uptake of N₂O₅ on TiO₂ was done very systematically and the manuscript is well written. The manuscript describes the determination of the uptake coefficient of N₂O₅ on TiO₂ particles at room temperature for the first time. Since the refractive index of TiO₂ is more than 60% greater than that of H₂SO₄ particles, main light scattering particles in the stratosphere, it requires much less amount to

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inject into the stratosphere to reduce the global warming. Unlike H₂SO₄, TiO₂ would not presumably activate chlorine production to cause ozone-destructing chain reaction. Consequently, it would increase stratospheric ozone, thereby lowering photolysis rates in the troposphere and increases in N₂O₅ concentration.

I have only some minor comments:

1. page 4424, para 1: How much TiO₂ has to be injected into the stratosphere to have a perceptible impact? 2. What are other pathways for N₂O₅ loss on TiO₂ than just hydrolysis? Is it possible to have NO₂ produced as a result of the uptake? In such a situation, what would be the impact in terms of ozone depletion? 3. page 4430, lines 15-24: This assumption is fine on a relative scale. However, one N₂O₅ does not give one NO₂ and one NO₃. There is always some loss of NO₃ to give NO₂ + O₂. 4. Page 4434, line 10- 25: It is good to see a detailed and rigorous of the diffusion correction. However, diffusion correction for small uptake coefficient values is negligible. Page 4438, line 13: “P25” should be “P2.5”

This paper is by no means a complete study as pointed out by authors regarding the photocatalytic activity of TiO₂. However, it did a comprehensive experiment and discussion of the results on the uptake of N₂O₅ on TiO₂ particles

Page 4441, line 29 (last line): “feedbacks” should be “feedbacks”.

This manuscript should be accepted addressing a few minor points.

Please also note the supplement to this comment:

<http://www.atmos-chem-phys-discuss.net/14/C1505/2014/acpd-14-C1505-2014-supplement.pdf>

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 4421, 2014.

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